

CLAIMS

1. A full spectrum black-and-white reflective chiral nematic display, comprising:
 - (i) a chiral nematic display of controllable planar structure and focal conic structure;
 - ii) two transparent substrates said substrates having conductive electrodes;
 - iii) two elliptical polarizers;
 - iv) said chiral nematic liquid crystal material being between the two transparent substrates;
 - v) said liquid crystal material and said transparent substrates being between said polarizers; and
 - v) the display further comprising an optical reflector.
2. A display device as defined in Claim 1, wherein one elliptical polarizer is of opposite polarity to the chiral nematic liquid crystal material.
3. A display device as defined in Claim 1, wherein there is an optically "ON" bright state when the chiral nematic materials are in the focal conic state.
4. A display device as defined in Claim 3, wherein said optically "ON" bright state of full spectrum white.
5. A display device as defined in Claim 1, wherein there is an optically "OFF" dark state when the chiral nematic material is in the planar state.
6. A display device as defined in Claim 1, wherein the chiral nematic material has the reflection spectrum of a particular peak wavelength and elliptical polarization.
7. A display device as defined in Claim 1, wherein the two elliptical polarizers are of opposite polarities.

8. A display device as defined in Claim 1, wherein the two elliptical polarizers are selected from the group comprising wideband and otherwise than wideband.
9. A display device as defined in Claim 1, wherein the chiral nematic display is sandwiched between two orthogonal elliptical polarizers and wherein the reflector is laminated on the rear elliptical polarizer.
10. A display device as defined in Claim 1, wherein the arrangement of front and rear elliptical polarizers is such that the light entering into the chiral nematic material from above or below is elliptically polarized.
11. A display device as defined in claim 1, wherein the arrangement of the rear elliptical polarizer is such that the light incident on the reflector is linearly polarized.
12. A display device as defined in Claim 1, wherein the light leaving the front elliptical polarizer entering the chiral nematic material is elliptically polarized with opposite polarity to that of the chiral nematic material, the front elliptical polarizer being of opposite polarity to the chiral nematic material.
13. A display device as defined in Claim 1, wherein the rear elliptical polarizer is of the same polarity as the chiral nematic material.
14. A display device as defined in claim 1, wherein the reflector is diffusive.
15. A display device as defined in claim 1, wherein the "ON" state is caused by depolarisation of light passing through the focal conic state chiral nematic material.
16. A display device as defined in claim 1, wherein in the "ON" state of the device the depolarisation is independent of wavelength.

17. A display device as defined in claim 1, wherein in the "OFF" state of the device the opposite polarity of elliptically polarized light enters into the planar state chiral nematic material and passes through without any polarization change.
18. A display device as defined in claim 1, wherein the "OFF" state of the device is caused by the absorption of light by a pair of orthogonal front and rear elliptical polarizers.
19. A display device as defined in claim 1, wherein in the "OFF" state of the device the absorption of light is independent of wavelength.
20. A display device as defined in claim 1, wherein both elliptical polarizers are of opposite polarity to the chiral nematic liquid crystal material.
21. A full spectrum black-and-white reflective chiral nematic display, comprising:
- (i) a chiral nematic display of controllable planar structure and focal conic structure,
 - (ii) two transparent substrates, each of said substrate being coated with a transparent electrode;
 - (iii) two elliptical polarizers, both being of opposite polarity to that of the chiral nematic liquid crystal; and
 - (iv) an optical reflector;
 - (v) wherein said chiral nematic liquid crystal materials is sandwiched between said two substrates; and
 - (vi) wherein said liquid crystal material and said two substrates are between said two polarizers.

22. A display device as defined in claim 21, wherein an optically "ON" bright state is when the chiral nematic materials are in the planar state.

23. A display device as defined in claim 22, wherein the optically "ON" bright state is of full spectrum white.

24. A display device as defined in claim 21, wherein an optically "OFF" dark state is when the chiral nematic materials are in the focal conic state.

25. A display device as defined in Claim 21, wherein the chiral nematic material has the reflection spectrum of a particular peak wavelength and elliptical polarization.

26. A display device as defined in Claim 21, wherein the two elliptical polarizers are of the same polarity and being both opposite to the polarity to the chiral nematic liquid crystal materials.

27. A display device as defined in Claim 21, wherein the chiral nematic display is sandwiched between the two elliptical polarizers and wherein the reflector is laminated on the rear elliptical polarizer.

28. A display device as defined in Claim 27, wherein the two elliptical polarizers are selected from the group comprising wideband and otherwise than wideband.

29. A display device as defined in Claim 21, wherein the arrangement of front and rear elliptical polarizers is such that the light entering into the chiral nematic material from above or below is elliptically polarized.

30. A display device as defined in Claim 21, wherein the arrangement of the rear elliptical polarizer is such that the light incident on the reflector is linearly polarized.

31. A display device as defined in Claim 21, wherein the reflector is diffusive.
32. A display device as defined in Claim 21, wherein the "ON" state is caused by maintaining the elliptical polarization opposite to the chiral nematic material along the subsequent optical path after the first time passing through the front polarizer when the chiral nematic material is at a planar state.
33. A display device as defined in Claim 32, wherein in the "ON" state the entire optical path is independent of wavelength.
34. A display device as defined in Claim 21, wherein the "OFF" state is as a result of the depolarisation of light at the focal conic chiral nematic materials.
35. A display device as defined in Claim 34, wherein in the "OFF" state the depolarization of light is independent of wavelength.
36. A display device as defined in Claim 21, wherein the transparent substrate has properties such that the polarization of the light passing through it is not affected.
37. A display device as defined in Claim 21, wherein said device is made to full colour by adding a colour filter at any location in the structure.
38. A display device as defined in Claim 21, wherein said device is made to area colour by adding a colour filter at any location in the structure.
39. A display device as defined in Claim 21, wherein the device has grey scale capability and wherein the planar structure and the focal conic structure co-exist within the pixel area.

40. A display device as defined in Claim 39, wherein different tones of grey scale within any pixel are caused by different ratios of planar structure and focal conic structure domains of the chiral nematic materials in a local area.

41. A display device as defined in Claim 21, wherein there is a driving scheme for chiral nematic materials.

42. A display device as defined in Claim 21, wherein lower threshold voltage can be achieved by using a longer pitch chiral nematic material.

43. A display device as defined in Claim 21, wherein lower threshold voltage can be achieved by using a smaller cell gap